Proposed Appropriation Language
DEPARTMENT OF ENERGY
FY 1999 CONGRESSIONAL BUDGET REQUEST

## Energy Conservation

For necessary expenses in carrying out energy conservation activities, **[**$611,723,000**]**, *$808,500,000* to remain available until expended, including, notwithstanding any other provision of law, the excess amount for fiscal year **[**1998**]** *1999* determined under the provisions of section 3003(d) of Public Law 99-509 (15 U.S.C. 4502): *Provided,* That **[**$155,095,000**]** *$191,100,000* shall be for use in energy conservation programs as defined in section 3008(3) of Public Law 99-509 (15 U.S.C. 4507) and shall not be available until excess amounts are determined under the provisions of section 3003(d) of Public Law 99-509 (15 U.S.C. 4502): *Provided further,* That notwithstanding section 3003(d)(2) of Public Law 99-509 such sums shall be allocated to the eligible programs as follows: **[**$124,845,000**]** *$154,100,000* for weatherization assistance grants and **[**$30,250,000**]** *$37,000,000* for State energy conservation grants. *(Department of the Interior and Related Agencies Appropriations Act, 1998.)*

## EXPLANATION OF CHANGE

Deletes funding amounts which had specific application to FY 1998 and includes the appropriate funding amounts for FY 1999.

DEPARTMENT OF ENERGY
FY 1999 CONGRESSIONAL BUDGET REQUEST
Energy Efficiency and Renewable Energy
Energy Conservation
(Tabular dollars in thousands, Narrative in whole dollars)

Energy Efficiency Programs

## EXECUTIVE SUMMARY

### Introduction

The programs of the Office of Energy Efficiency and Renewable Energy (EERE) funded by the Interior and Related Agencies Appropriations Subcommittee are designed to improve the fuel economy of automobiles and other vehicles, increase the productivity of the nation's most energy-intensive and polluting industries, and improve the energy efficiency of buildings and appliances. EERE's programs work in voluntary cost-shared partnerships with the nation's utilities, industries, states, and the public to advance the development and deployment of clean and efficient energy technologies. By developing the means to manage energy use, EERE provides tools for the nation, its industries, and its citizens to be smart about energy -- to use energy more efficiently, with fewer financial and environmental costs. By promoting energy efficiency, EERE's programs help to strengthen the economy, improve the environment, and ensure a more secure future.

In its 1997 review of the national energy R&D portfolio, the President's Committee of Advisors on Science and Technology recommended expansion of a number of national energy R&D programs, and targeted energy efficiency programs for the greatest increases in funding. The Committee noted that energy efficiency technologies produce near-term and rapidly expanding public benefits, including air emissions reductions, reduced dependence on imported oil, and lower costs to households and firms. According to the Committee's analysis, R&D investments in energy efficiency have contributed to efficiency improvements that save U.S. consumers approximately $170 billion per year. The Committee called for significant expansion of energy efficiency programs in order to meet the energy challenges and opportunities of the 21st century.

**EXECUTIVE SUMMARY**: Energy Efficiency Programs (Cont'd)

EERE's programs target Federal resources in key areas that provide critical national benefits; stimulate complementary private investments; leverage market forces; and respond to five significant drivers:

- National Security;
- Economic Competitiveness;
- Environmental Quality;
- Climate Change; and,
- Electric Utility Restructuring.

*National Security*

During the past 23 years, three major disruptions in the world oil market have shaken the global economy. In 1996, U.S. net oil imports accounted for approximately 45 percent of domestic petroleum consumption. By 2020, U.S. net oil imports are expected to grow to over 65 percent of domestic petroleum consumption, with Persian Gulf nations accounting for over 65 percent of the world's oil exports. In 2020, U.S. net annual expenditures for imported crude oil and products are projected to exceed $130 billion in current dollars. Given historical precedents and future oil market trends, the United States has a critical interest in diminishing the nation's reliance on foreign oil through improved efficiency and use of indigenous renewable energy sources. EERE's efforts to implement a smart energy policy recognize this security concern and work to reduce U.S. dependence on foreign oil. As a related benefit, EERE's work on efficiency and renewable energy reduces the U.S. trade deficit by reducing costly energy imports.

*Economic Competitiveness*

In addition to reducing the nation's vulnerability to disruptions in energy supplies, EERE's research and development efforts advance U.S. economic interests. Carried out in partnership with industry, national laboratories, and universities, EERE's research and development programs are designed to maintain America's technological expertise and competitive advantage in the global market. A smart energy policy, as promoted by EERE's programs, strengthens the nation's economic power. EERE's investments not only lay the foundation for a more sustainable energy future but also open markets for manufacturers of advanced U.S. technology. EERE sponsors international programs to promote U.S. energy efficiency goods and services in international markets. EERE also participates in the Department's Science Education programs to cultivate the next generation of science and technology leaders and ensure the nation's continued economic competitiveness.

EERE's work with the nation's most energy-intensive and polluting industries results in productivity enhancements and savings in energy and environmental compliance costs. By cultivating clean and energy efficient industries, EERE is helping to assure the long-

term competitiveness of U.S. industry. EERE technologies also lead to greater worker productivity through lighting and other work space improvements.

*Environmental Quality*
Air pollution, particularly in urban centers, ranks high among the nation's most pressing environmental concerns. In advancing a smart energy policy, EERE programs work to mitigate and minimize the environmental costs associated with energy use. By developing technologies that improve energy efficiency in industry and buildings, EERE's programs are concurrently identifying ways to reduce energy-related air pollutants. Furthermore, EERE's work on vehicle technologies will lead to greater fuel-efficiency as well as use of alternative fuels -- both offering impressive reductions in emissions.

*Climate Change*
The President's FY 1999 budget request for EERE programs is a major element of his proposal to invest $5 billion over five years to reduce greenhouse gas emissions to below 1990 levels by 2008 - 2012 through energy technology research and development and tax incentives. In 1997, a major study conducted by five national laboratories documented the critical role that development and deployment of energy efficiency and renewable energy technologies can play in reducing greenhouse gases. Given the cost savings associated with these technologies, the study noted that aggressive investment in energy R&D and deployment could lead to significant emissions reductions without raising the nation's energy bill.

*Electric Utility Restructuring*
EERE is working with utilities, industry, states, and consumers to ensure that utility restructuring results in a competitive and effective electricity generation industry. Utility restructuring presents an opportunity to reduce energy costs, advance the use of energy efficient and renewable energy technologies, and provide affordable services with reduced environmental impacts.

**Long-Term Priorities**
EERE oversees a wide range of research, development, and deployment activities that lead to energy savings, enhanced industrial productivity and competitiveness, environmental benefits, and carbon emissions reductions. The following goals reflect some of EERE's most important priorities under the Interior and Related Agencies Appropriations Subcommittee and will help to direct its work in FY 1999:

- Advance the Partnership for a New Generation of Vehicles goal of developing by 2004 prototype mid-sized cars, capable of 80 miles per gallon and two-third reductions in nitrogen oxides ($NO_x$) and carbon dioxide ($CO_2$) emissions, without compromising safety, comfort, performance, and cost.

- Develop advanced turbines that can reduce annual industrial energy costs by $500 million and carbon emissions by nearly 1.7 million metric tons in 2010.

- By 2010, improve efficiency of the nation's most energy intensive industries and reduce energy-related releases of carbon dioxide, sulfur oxides, nitrogen oxides, particulates, and other wastes by as much as 5 percent relative to projected emissions.

- By 2010, improve the energy efficiency of the nation's new homes by 50 percent; commercial buildings by 30 to 50 percent; and existing buildings by 20 percent.

- By 2005, improve energy efficiency in Federal buildings by 30 percent over 1985 levels.

**Using Federal Resources Wisely: Maximizing Public Benefit**

EERE has developed expertise in setting program goals, measuring performance, and defining budget priorities based on projected benefits. EERE also works closely with industry to set research goals and leverage private sector resources. In an effort to build on these practices, EERE is pursuing the following management principles to ensure that its research, development, and deployment programs invest resources effectively and efficiently and achieve the greatest public benefit.

- *Increasing the Use of Competitive Solicitations:* EERE is increasing the amount of its program funds that will be awarded competitively. By issuing competitive solicitations, EERE will be able to evaluate and compare proposals and fund the most promising technologies. A number of EERE programs will issue broad solicitations in order to select among a wide range of technologies, rather than narrowly investing in each industry. This type of competitive process will lead to more effective use of R&D funds.

- *Measuring Performance:* As noted above, EERE assesses the progress of its programs against defined criteria. In particular, EERE projects the energy displaced, cost savings, and carbon reductions associated with its programs. EERE will continue to measure performance of its programs and quantify associated benefits. As a related effort, EERE will continue to use peer review to help evaluate programs and set priorities.

- *Terminating Activities:* As part of EERE's commitment to investing resources efficiently, EERE will discontinue activities that do not meet pre-determined goals. Completed and discontinued projects are highlighted in the sector descriptions of this executive summary.

- *Coordinating Cross-Cutting Activities:* EERE's sector programs work on a number of related projects that serve the interests of multiple customers. Furthermore, EERE represents only one part of public and private investment in energy technologies. The Department of Energy's Offices of Fossil Energy, Nuclear Energy, and Energy Research, along with other Federal agencies, are involved in complementary research. EERE is committed to working closely with its public and private sector partners to avoid redundancy and direct R&D to achieve the greatest public benefit.

- *Improving Deployment through Support Offices:* EERE's sector programs rely on six regional support offices (RSOs) to implement a number of important activities. RSOs collaborate with regional interests and ensure that EERE programs and technologies are deployed at the state and local level. This executive summary includes a section on RSOs with functions, funding, and staff levels.

- *Clarifying the Budget:* As the FY 1999 budget illustrates, EERE is working to clarify how funds are used across sectors and in the regional support offices. In particular, EERE is requesting specific increases in the program direction account for cross-cutting activities that were formerly funded through directed funding from sector program accounts.

- *Reducing Uncosted Balances:* Since the beginning of FY 1996, EERE has reduced its uncosted balances by over 40 percent. EERE is committed to managing and investing its resources wisely, and will continue to work to lower remaining balances.

- *Collaborating with Customers:* EERE works closely with Congress, industry, states, interest groups, national laboratories, utilities, universities, and others to set research and development priorities, identify program opportunities, deploy technologies, and disseminate information more effectively. EERE involves its customers and partners in all stages of research and development, including concept development, market and technical feasibility studies, system and component design, research plans, prototype construction and testing, demonstrations, and deployment. In many cases, EERE activities are jointly funded with private sector or other public sector players.

## FY 1999 CONGRESSIONAL BUDGET REQUEST

In support of its priorities, EERE submits the following FY 1999 budget request to the Interior and Related Agencies Appropriations Subcommittee:

**Office of Energy Efficiency and Renewable Energy**
**Energy Efficiency Programs**
**FY 1999 Congressional Budget Request**
(in millions of dollars)

| | FY 1997 | FY 1998 | FY 1999 Request | Program Change |
|---|---|---|---|---|
| Industrial Technologies | 115.4 | 136.2 | 166.6 | +30.4 |
| Transportation Technologies | 172.5 | 193.3 | 246.1 | +52.8 |
| Building Technology, State and Community Programs | 229.9 | 233.9 | 317.5 | +83.6 |
| Federal Energy Management Program | 19.8 | 19.8 | 33.9 | +14.1 |
| Policy and Management | 26.4 | 28.5 | 44.4 | +15.9 |
| Total Program Funding | 564.0 | 611.7 | 808.5 | +196.8 |
| PODRA and Prior Year Balances | -30.5 | -20.6 | -35.0 | -14.4 |
| Total Budget Authority[1] | 533.5 | 591.1 | 773.5 | +182.4 |

[1]Total Budget Authority figures take into account prior year balances and projected receipts associated with the Petroleum Overcharge Distribution and Restitution Act (PODRA).

The following overview summarizes the program's projected benefits, sector activities, cross-cutting programs, and regional support office responsibilities. Each sector description provides information on new activities for FY 1999, projects to be discontinued or completed in FY 1998 and FY 1999, and ongoing programs.

## EERE PROGRAM BENEFITS

EERE's research, development and deployment of energy technologies have led to billions of dollars in energy cost savings over the past decade. Over the next 25 years, there will be significant additional benefits associated with each sector's programs, including increased energy efficiency, and associated cost savings and emissions reductions.

Projected energy, economic, and environmental savings are presented in the following table. *Total Primary Energy Displaced* refers to the amount of conventional, fossil, or electric energy directly displaced through energy efficiency improvements. One quadrillion BTUs has the energy equivalent of 172 million barrels of oil. *Energy Cost Savings* represents the annual dollar savings that consumers will realize through reduced energy consumption. Finally, the carbon figures represent the amount of carbon equivalent emissions that will be avoided due to reduced energy consumption. EERE uses carbon reductions because in many applications they serve as a useful measure and surrogate for a wide variety of energy-related pollutants, including carbon monoxide (CO), nitrogen oxides ($NO_x$), sulfur oxides ($SO_x$), particulates, and in some cases, heavy metals.

**Office of Energy Efficiency and Renewable Energy**
**Energy Efficiency Programs Projected Annual Benefits by Sector through the Year 2020**

| | Total Primary Energy Displaced (Quadrillion BTUs) | | | Energy Cost Savings ($ billions) | | | Carbon Reductions (million metric tons) | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2000 | 2010 | 2020 | 2000 | 2010 | 2020 | 2000 | 2010 | 2020 |
| **Transportation Sector**<br>*(oil savings in quads)* | 0-.01 *(.07-.13)* | .93-1.23 *(1.33-2.40)* | 2.49-2.74 *(3.05-4.17)* | 0-.49 | 7.57-9.68 | 15.5-20.54 | .3-.64 | 17.9-26.66 | 47-55.17 |

**EXECUTIVE SUMMARY:** Energy Efficiency Programs (Cont'd)

| | Total Primary Energy Displaced (Quadrillion BTUs) | | | Energy Cost Savings ($ billions) | | | Carbon Reductions (million metric tons) | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2000 | 2010 | 2020 | 2000 | 2010 | 2020 | 2000 | 2010 | 2020 |
| **Industry Sector** | .15-0.27 | .95-1.46 | 1.52-2.47 | .58-1.03 | 3.06-4.65 | 4.79-7.72 | 2.3-5.39 | 16.5-30.74 | 31.8-51.63 |
| **Building Technology, State & Community Sector** | .07-.07 | 1.41-2.04 | 2.8-5.46 | 0.50-0.50 | 9.77-14.13 | 18.63-36.34 | 1.1-1.45 | 22.4-44.86 | 47.2-120.1 |
| **Federal Energy Management Program** | .06 | .24 | .31 | .42 | 1.41 | 1.92 | 1.16 | 4.4 | 5.63 |

Note: The program benefit ranges are developed through an impact analysis process undertaken annually by the Office of Energy Efficiency and Renewable Energy (EERE). The upper point of each range is based on analysis conducted by EERE's sectors and externally reviewed by Arthur D. Little. The sectors analyze the impacts their programs will have on energy savings, cost savings, and carbon reductions if all program goals are met. The lower point of each range for energy displaced and carbon reductions is derived from an integrated analysis model run by external contractors that controls for interaction effects. The integrated analysis model accounts for inter- and intra-sector double-counting as well as market trends, including reductions in new electricity generation. The lower point of the energy cost savings range is calculated by multiplying the total primary energy displaced, derived from the integrated analysis, by the sector's energy cost savings/total primary energy displaced ratio for that year.

## OFFICE OF INDUSTRIAL TECHNOLOGIES

***Resource Efficiency for Industry***

Industry consumes over a third of the energy delivered in the United States and spends tens of billions of dollars annually for pollution abatement and control. Seven industries account for 82 percent of the energy used in manufacturing: pulp and paper; steel; aluminum; metal-casting; chemicals; petroleum refining; and stone, clay and glass. These industries also account for over 80 percent of air emissions and over 90 percent of waste produced by U.S. manufacturing. The Office of Industrial Technologies focuses on developing innovative technologies to assist major industry sectors in becoming more resource efficient, and thereby more productive and competitive and less polluting.

**Industrial Technologies Program Funding**
(in millions of dollars)

| | FY 1997 | FY 1998 | FY 1999 Request | Program Change |
|---|---|---|---|---|
| Industries of the Future (Specific) | $45.3 | $53.1 | $76.0 | $+22.9 |
| Industries of the Future (Crosscutting) | 38.4 | 49.1 | 49.4 | +0.3 |
| Technology Access (e.g.; Motor Challenge; National Industrial Competitiveness through Energy, Environment, and Economics; and Industrial Assessment Centers) | 24.8 | 26.3 | 32.0 | +5.7 |
| Program Direction | 6.9 | 7.7 | 9.2 | +1.5 |
| Total | $115.4 | $136.2 | $166.6 | $+30.4 |

**EXECUTIVE SUMMARY:** Energy Efficiency Programs (Cont'd)

**NEW ACTIVITIES IN FY 1999**

As a corollary to its work with the steel and aluminum industries, OIT will initiate work with the mining industry in developing a technology road map and beginning directed research. In addition, OIT will significantly expand its research in bio-based renewable feedstocks to support an agriculture industry vision. OIT will initiate a deployment program aimed at increasing the efficiency of steam and compressed air systems in industry, modeled after the Motor Challenge program.

OIT will also focus on developing technologies specifically aimed at reducing greenhouse gases of all types. A competitive solicitation will be conducted and be open to all industries, with emphasis on those industries that have developed industry-wide visions and associated road maps. OIT will select proposals that offer the greatest impact on greenhouse gases and have widespread applicability to industry.

**ACTIVITIES TO BE TERMINATED IN FY 1998**

In the Industries of the Future program, OIT is concluding its current work with the petroleum refining industry due to the lack of progress in developing a vision and technology road map to direct future work. OIT is also terminating its Climate Wise program which received no appropriations in FY 1998, and is not included in the FY 1999 request.

**PROGRAM IN BRIEF**

The Office of Industrial Technologies (OIT) works with the nation's most energy-intensive industries to focus cooperative research on increasing energy efficiency and improving the environment. These industries could save over $10 billion in industry energy costs by 2010, and reduce carbon dioxide emissions by millions of tons per year.

OIT has developed visions and signed partnership agreements with the metal-casting, glass, aluminum, forest products, steel, and chemical industries. In addition, OIT is helping to facilitate the creation of industry visions with other trades, including forging, heat treating, mining, and agriculture.

The program will build on advances and opportunities in a number of industries including:

- **Forest Products:** With over 50 projects underway, OIT's partnership is developing technologies to reduce energy use in the drying of paper as well as emissions and effluents from paper mills.

**Visions for Industries of the Future**

Two key elements of the Industries of the Future strategy are each industry's "vision of the future" and "technology road map." Before initiating new research, each industry develops a vision and then a road map which outlines how to achieve the vision. The vision and road map guide industry- and government-funded research to advance U.S. industrial technology and create significant economic and environmental benefits.

- **Steel:** OIT will conduct research to reduce nitrogen oxide and other emissions from combustion processes in steel production, and to improve recycling of iron units from current production processes.

- **Aluminum:** OIT will continue research and development on the technology priorities identified in the Aluminum Industry Technology Road Map. With the goal of reducing energy consumption and emissions by about 30 percent, OIT is developing an advanced production cell that will result in a more efficient and cost-effective aluminum manufacturing process. By using non-carbon anodes that do not emit carbon, these advanced cells result in carbon reductions from both an improved design as well as a more energy efficient process. OIT is also developing a spray forming technology for continuous production of aluminum sheet using molten aluminum metal. This forming technology will result in fewer process steps, reduced energy and processing costs, as well as a metallurgically superior product, compared to alternative forming technologies.

- **Metal-Casting:** OIT will perform computer modeling of several casting processes and develop tools and new sensors to improve die-cavity filling. New efforts will focus on waste characterization, reduction, reuse, and alternative uses of foundry wastes.

- **Glass:** OIT will continue work initiated in FY 1998 on projects in process modeling, furnace refractory materials, and sensors for measurement and control of production and fabrication processes. OIT will also issue a competitive solicitation to target high priority research needs identified in the glass industry technology road map in the areas of production and energy efficiency, environmental protection and recycling, and innovative uses of glass.

**EXECUTIVE SUMMARY**: Energy Efficiency Programs (Cont'd)

- **Chemicals:** OIT will continue research and development in computational fluid dynamics, catalysis, separations, and bio-processes and complete a number of projects with national laboratories. In addition, research in bio-based renewable feedstocks will support the chemical industry's linkages to new agricultural industry.

- **Advanced Turbines and Materials:** OIT's efforts to develop advanced turbine systems for all sectors, including industry, utilities, federal installations, and large private buildings, will improve the efficiency of gas turbines by 15 percent and reduce their emissions by 80 percent. OIT is developing a number of materials geared at enhancing industrial productivity, including nickel aluminides for steel mills and ceramic materials that resist corrosion and high temperatures.

- **Technology Access:** OIT will continue to assist U.S. manufacturers in all sectors with immediate and near-term technical assistance through a variety of programs, including the National Industrial Competitiveness through Energy, Environment and Economics ($NICE^3$) program, Motor Challenge, and the Industrial Assessment Centers. In addition to providing technical assistance to a wide range of industries, these programs provide education and training; industry networking; waste, energy, and productivity assessments; showcase demonstrations; and software tools that assist manufacturers in evaluating and improving energy efficiency. OIT is working to ensure that all of the Technology Access programs provide integrated and efficient service to industrial customers, with a particular emphasis on small and medium manufacturers. As part of its new operating approach, OIT undertook a critical review of its Inventions and Innovation program. As a result, OIT is working to significantly reduce the processing time for grants issued to inventors and small technology based companies. A competitive solicitation to invest in promising energy efficient technologies will be issued in FY 1998; competitive awards will be granted in FY 1999.

## OFFICE OF TRANSPORTATION TECHNOLOGIES

***Cleaner Transportation and Energy Security***

The U.S. transportation sector accounts for two-thirds of the nation's annual oil consumption and depends on oil for 97 percent of its fuel. The Office of Transportation Technologies (OTT) funds research, development and deployment of technologies that can significantly alter current trends in energy demand, particularly for oil. Commercialization of innovative transportation technologies and alternative fuels is the nation's best strategy for reducing reliance on oil. These advanced technologies can also result in dramatic reductions in criteria pollutants and greenhouse gas emissions from the transportation sector. The development and market acceptance of advanced transportation technologies (advanced clean diesel engines, hybrid vehicles, electric vehicles, fuel cell vehicles) and alternative fuels (ethanol from biomass, natural gas, electricity and others) have the potential to reduce oil consumption by 1 million barrels per day in 2010 and 2 million barrels per day in 2020; and reduce greenhouse gas emissions by 25 to 30 million metric tons in 2010 and by 50 to 60 million metric tons in 2020.

**Transportation Technologies Program Funding (in millions of dollars)**

| | FY 1997 | FY 1998 | FY 1999 Request | Program Change |
|---|---|---|---|---|
| Technology Deployment | $10.6 | $11.8 | $16.3 | $+4.5 |
| Advanced Automotive Technologies | 102.7 | 113.3 | 144.6 | +31.3 |
| Advanced Heavy Vehicle Technologies | 19.1 | 25.6 | 44.2 | +18.6 |
| Transportation Materials Technologies | 32.3 | 35.0 | 31.8 | -3.2 |
| Implementation and Program Management | 7.7 | 7.6 | 9.2 | +1.6 |
| Total | $172.5 | $193.3 | $246.1 | $+52.8 |

**NEW ACTIVITIES IN FY 1999**

OTT's expanded R&D on diesel engines for light trucks will support three development teams, with a 50 percent minimum cost share, over five years. This effort reflects planned funding levels and the program's goal of deploying clean diesels in the light truck market by 2004. OTT will integrate this effort with other diesel R&D being conducted by DOE and EPA as part of PNGV.

In a joint program with the Department of Transportation, DOE will support electric and hybrid electric vehicle development for medium and heavy duty trucks, through regional consortia of industry, academia, state, and local governments. Previously funded and managed under the Defense Advanced Research Projects Agency program (DARPA), this R&D effort will now focus on developing applications targeted at medium and heavy duty trucks and buses. DOE and DOT will continue to work with the Advanced Transportation Technology Consortia to set priorities and direct R&D.

In addition to promoting the deployment of alternative fuel technologies, OTT will begin promoting advanced technology vehicles that car manufacturers and DOE recently exhibited. OTT will expand the scope of Clean Cities to include advanced technology vehicles, and expand grants to states and Clean Cities to demonstrate these vehicles, support innovative refueling infrastructure, and promote greenhouse gas emissions reductions. OTT will enhance the congressionally mandated Fuel Economy Guide and other information products to encourage broader use of fuel efficient and advanced technology vehicles. OTT will test and evaluate "state of the art" electric and hybrid vehicles. OTT will also focus on regulatory activities -- especially regarding Federal fleets -- in order to continue the promotion of existing alternative fuel vehicles.

The Partnership for a New Generation of Vehicles (PNGV) will support development of enabling technologies needed for an 80 mpg automobile (e.g., power electronic building block technology and high power energy storage devices.) For fuel cell vehicle systems, OTT will develop and test an advanced, high-efficiency, 50 kilowatt fuel-flexible fuel processor with 70 percent efficiency and a start-up time of less than three minutes. In compression ignition direct injection (CIDI) technology, OTT will expand its catalyst and plasma-assisted catalytic systems to full scale prototypes; apply closed loop controls to direct aftertreatment devices and combustion processes; and, benchmark prototypes in current CIDI multi-cylinder engines.

**ACTIVITIES TO BE TERMINATED IN FY 1998**

Given its focus on the most promising technologies, OTT is ending its research on gas turbines for vehicles, which has failed to progress sufficiently toward meeting design requirements. This project, conducted in collaboration with three major turbine manufacturers, was funded through FY 1997 and completed in FY 1998 with no additional funds. In addition, OTT will discontinue research and development on a number of PNGV enabling technologies including the Stirling engine, flywheels, and ultracapacitors. Each of these

technologies was found to be unable to attain one or more of the PNGV performance, cost, and manufacturing criteria. OTT has made these decisions in collaboration with its automotive partners.

**PROGRAM IN BRIEF**

***Advanced Automotive Technologies***

The Advanced Automotive Technologies program serves as the technological cornerstone for the Partnership for a New Generation of Vehicles (PNGV) -- our nation's partnership with the U.S. automobile manufacturing industry. With OTT's support, PNGV focuses on significantly improving the energy efficiency of automobiles and reducing associated emissions. Research and development activities in support of PNGV will emphasize four key system areas: hybrid-electric vehicle drive, direct-injection engines, fuel cells, and lightweight materials. The auto industry provides a significant share of the funding for PNGV research, which is aimed at a production prototype car with fuel efficiency of up to 80 miles per gallon by 2004. Announcements in 1997-1998 by the auto industry suggest that the PNGV goal is within reach and the government-industry partnership is working as envisioned.

In partnership with the U.S. Advanced Battery Consortium (USABC), which includes the major U.S. automobile manufacturers and the Electric Power Research Institute (EPRI), OTT supports research to improve the range, performance and cost of electric and hybrid vehicles and to evaluate new electric vehicles. Through this partnership, OTT has begun extensive in-vehicle testing of lithium polymer batteries, which could offer 3 to 4 times the range, and significantly greater performance and life, compared to conventional lead acid batteries.

***Advanced Heavy Vehicle Technologies***

The Office of Transportation Technologies has requested funding to work with industry partners to develop technology to increase the fuel efficiency of light trucks by improving the efficiency of diesel engines. Light trucks, including vans, pickups, and sport utility vehicles, represent the most rapidly growing segment of today's vehicle market. Improving their fuel economy while simultaneously reducing their emissions would have a dramatic impact on the nation's transportation energy consumption. OTT will undertake preliminary design, cycle analysis, and testing of the diesel engine for sport utility vehicles and pickup trucks in FY 1999. The program is developing technologies in support of significantly reduced emissions for medium sized trucks. The development of light truck diesel

engines will be closely coordinated with development of compression ignition direct injection engines in the PNGV, since most of the emissions control technologies envisioned for PNGV are also applicable to light duty trucks.

In FY 1999, program efforts to improve efficiency in large diesel engines will be coordinated with alternative fuels research and development efforts. Alternative fuels R&D activities will focus on developing advanced enabling technologies for the diesel engine to be fuel flexible. These engines will perform optimally on high cetane quality alternative fuels and blends (e.g., dimethyl ether) as well as on natural gas and renewable fuels such as bio-diesel and ethanol-derived diethyl ether. OTT will apply research tools developed for diesel fuel combustion R&D to study energy conversion efficiency and emissions from alternative fuel use. Fuel formulation strategies will focus on minimum exhaust emissions.

***Transportation Materials Technology***

New materials and material technologies are critical to the development and engineering of advanced transportation vehicles. The Office of Transportation Technologies supports materials research and development for both automobiles and trucks. These efforts focus on the development of lightweight vehicle materials that can reduce the weight of vehicles and decrease fuel consumption without compromising safety.

The High Temperature Materials Laboratory serves as a modern research facility with six user centers and a unique collection of advanced instruments for characterizing materials. By providing access to state-of-the-art equipment that few individual companies and institutions can afford, the laboratory enables scientists and engineers to solve materials problems that limit the efficiency and reliability of advanced energy conversion systems.

***Technology Deployment***

The Technology Deployment program promotes the acquisition of newly developed transportation technologies for both government and private fleets, to encourage their widespread penetration into domestic and foreign markets. The program focuses on commitments to alternative fuel vehicles through the Clean Cities program, public education, field testing and evaluation, and fleet programs established by the Energy Policy Act of 1992.

**Technology Highlight**
**Compression Ignition Direct Injection (CIDI) Automotive Engines**

The Partnership for a New Generation of Vehicles selected Compression Ignition Direct Injection (CIDI) technology for the heat engine component of its year 2004 concept vehicle. OTT's research resulted in the demonstration of crucial breakthrough technologies for nitrous oxide reduction. The success of on-going PNGV Cooperative Research and Development Agreements (CRADAs) is essential for developing an integrated CIDI automotive powerplant and fuel that will meet 2004 gaseous emissions standards as well as automotive industry criteria for cost and durability. OTT plans to continue assessing the performance and emissions of advanced CIDI engines fueled with reformulated or alternative fuels through FY 1999. These efforts will result in a cost effective emission control technique ($5/kW) that demonstrates sufficient durability (>3500 hours) to satisfy automotive industry partners.

**EXECUTIVE SUMMARY:** Energy Efficiency Programs (Cont'd)

Through the Clean Cities program, OTT encourages local governments and organizations to form public/private partnerships for developing alternative fuel vehicle markets. Over 60 Clean Cities now have a combined fleet of 165,000 alternative fuel vehicles, saving over 11 million gallons a year in oil consumption. Several of these local programs are linking across regional and state boundaries to strengthen efforts, expand purchasing power, and establish refueling infrastructure along Clean Corridors to enable inter-city travel of alternative fuel vehicles.

## OFFICE OF BUILDING TECHNOLOGY, STATE AND COMMUNITY PROGRAMS

### *Energy Efficiency at Home and at Work*

America's buildings—our homes and offices—consume roughly $220 billion worth of energy each year. Furthermore, heating and cooling, lighting, appliances, and equipment in buildings together account for over one-third of U.S. carbon emissions and a substantial amount of other pollutants.

The Office of Building Technology, State and Community Programs (BTS) is working with its partners in the private sector and in state and local government to make the nation's building stock more energy-efficient, comfortable, and affordable. To help achieve greater results in energy cost savings and associated emissions reductions, BTS is changing the way it does business. Based on its new strategic plan, BTS will refocus its research, development, and deployment on priorities set in collaboration with industry. Peer review and competitive solicitations will strengthen BTS' ability to achieve ambitious results. FY 1999 represents an important transition year as BTS takes its first step toward a refocused and improved program.

**Building Technology, State, and Community Programs Funding**
(in millions of dollars)

| | FY 1997 | FY 1998 | FY 1999 Request | Program Change |
|---|---|---|---|---|
| Building System Design | $23.3 | $23.0 | $36.3 | $+13.3 |
| Building Equipment and Materials | 26.1 | 26.9 | 46.2 | +19.3 |
| Codes and Standards | 11.8 | 14.4 | 22.6 | +8.2 |
| State and Local Partnership Programs | 151.4 | 156.7 | 197.7 | +41.0 |
| Management & Planning | 17.3 | 12.9 | 14.7 | +1.8 |
| Total | $229.9 | $233.9 | $317.5 | $ +83.6 |

## NEW ACTIVITIES IN FY 1999

In collaboration with its industry partners, BTS will develop technology road maps to direct its research, development, and deployment in a number of key areas, including lighting, heating and cooling, windows, other materials, and construction. As part of its new way of doing business, BTS plans to issue a competitive procurement to fund new cost-shared R&D projects on a wide range of building technologies, including lighting, heating and cooling, and materials. BTS will evaluate proposals and select those technologies that offer the greatest energy savings and environmental benefits. By putting the emphasis on outcomes (highest energy saving-to-dollar ratio, greatest consumer impact, time needed for success, greatest environmental benefit, etc.) and working closely with industry, BTS will accelerate the development of energy efficient technologies for buildings.

As part of the State and Local Partnership Programs, BTS will expand its Competitive Energy Partnerships with a solicitation directed at a wide range of public and private entities, including states, business improvement districts, homebuilders, retailers, public institutions, and non-profits. Through this competitive process, BTS will fund projects to establish more efficient and comfortable buildings and highly productive and affordable communities. BTS will evaluate projects based on short and medium term goals, including energy and dollar savings, job creation, and environmental benefits. With an emphasis on locally-driven priorities and partnerships with local businesses, these projects will encourage innovation in building design and energy technologies, lower the cost of housing, and strengthen the local economy by becoming more energy efficient and less reliant on nonrenewable energy sources.

## ACTIVITIES TO BE TERMINATED IN FY 1998

BTS will complete the following activities in FY 1998:

- Complete performance measurement of exemplary buildings constructed in FY 1995 and FY 1996 and publish findings.
- Issue final version of DOE-2, a highly successful software tool to assist in incorporating energy efficiency in building design and construction.
- Complete assessment of non-fluorocarbon refrigerant alternatives.
- Issue final rule to incorporate legislated standards and test procedures for plumbing equipment and large electric motors.

- Complete industrialized housing research, conducted by University of Oregon and Florida Solar Energy Center. (As a follow-up to this work, BTS plans to grant awards for research on industrialized housing based on a competitive solicitation issued in FY 1998.)

**ACTIVITIES TO BE TERMINATED IN FY 1999**

In FY 1999, BTS will complete the following projects:

- Provide final funding for Home Energy Rating Systems pilot states and for overcoming barriers to implementation of Home Energy Rating Systems.

- Complete successful seven-year jointly funded, industry-led program of materials compatibility and lubricant research that paved the way for a new generation of chlorine-free refrigerants.

- Complete laboratory support to CRADA partner Frigidaire to develop a pre-production refrigerator/freezer using 50 percent less energy than current designs.

- Complete the lighting controls project in a large Federal office building and report results to the General Services Administration for application at other Federal facilities.

- Issue final rule regarding energy conservation standards for lamp ballasts and water heaters.

**PROGRAM IN BRIEF**

***Buildings for the 21st Century: Progress with Whole Buildings***

Launched in FY 1997, Buildings for the 21st Century uses a "whole buildings" or systems engineering approach to achieve significant energy and carbon emissions savings. "Whole buildings" seeks to increase energy efficiency in the process of siting, design, construction, material and equipment selection, and financing of the nation's building stock. BTS will incorporate the whole buildings concept into vision statements and technology road maps designed with its industrial partners. BTS will continue to work with the Office of Utility Technologies and Federal Energy Management Program to integrate energy efficiency and solar technologies into new and existing buildings. BTS will also work cooperatively with other agencies to incorporate energy efficiency in ongoing activities such as school construction and the proposed Partnership in Advancing Technology for Housing (PATH).

***Building Equipment and Materials R&D***

Lighting and appliances account for a major portion of energy consumption in buildings. BTS will support research and development of a full range of technologies, including efforts to improve efficiency for "miscellaneous" uses of electricity, in appliances such as ceiling and furnace fans, dehumidifiers, controls, and electronic and communications devices.

BTS will also accelerate the development of proton exchange membrane (PEM) fuel cells for commercial buildings. PEM fuel cells for buildings differ from fuel cells for transportation because they are not as limited in size, can operate at high temperatures, and do not require quick startup. BTS expects these technologies to be available as a low-carbon option by 2004, with a potential to cut building energy requirements in half. In addition, BTS will advance desiccants, environmentally-friendly and energy efficient refrigerants, insulation and materials, and natural gas technologies for buildings, including natural gas heating and cooling equipment.

***State and Local Partnership Programs***

The Weatherization Assistance Program works with states and local agencies to increase the energy efficiency of homes occupied by low-income citizens -- particularly the elderly, those with disabilities, and families with children. Over 78,000 homes will be weatherized by the program in FY 1999. The State Energy Program provides support for states to undertake projects that will increase energy efficiency in transportation, buildings, and industry sectors and reduce greenhouse gas emissions. Other state projects focus on the use of renewable energy such as photovoltaics, solar thermal, geothermal and hydrogen technologies. These programs provide a means for deploying energy technologies at the state and local level. State and local organizations bring knowledge of regional needs to these partnerships and provide practical feedback loops to BTS' R&D efforts.

***Building Codes and Appliance Standards***

BTS provides assistance to states to update and implement building energy codes. BTS also issues standards and test procedures for a variety of appliances and equipment. According to guidelines defined in the 1996 process rule, BTS is working closely with industry and interest groups to set priorities, incorporate their input early in the development of standards, and expedite the process. With the likely introduction of an International Energy Code for new construction, BTS is working to strengthen its understanding of the marketplace and providing appropriate support to states and industry to advance energy efficiency in new construction.

## FEDERAL ENERGY MANAGEMENT PROGRAM

### *Saving Energy and Dollars at Federal Facilities*

As the nation's largest single energy user, the Federal government spends roughly $8 billion each year on energy required to operate its facilities, vehicles, and industrial equipment. The Federal Energy Management Program (FEMP) achieves significant Federal cost savings and associated environmental benefits by assisting Federal agencies in identifying, financing, and implementing energy efficiency and renewable projects in Federal facilities across the nation and at overseas missions. FEMP works to ensure that the Federal government serves as a leader in increasing energy productivity, reducing the nation's energy costs, and protecting the environment. FEMP saves additional taxpayer dollars by leveraging private resources through the use of Energy Savings Performance Contracts (ESPCs) and utility incentive programs.

**Federal Energy Management Program Funding**
(in millions of dollars)

| | FY 1997 | FY 1998 | FY 1999 Request | Program Change |
|---|---|---|---|---|
| Federal Energy Management Program | $19.8 | $19.8 | $33.9 | $+14.1 |

**NEW ACTIVITIES IN FY 1999**

The Federal Energy Management Program's FY 1999 budget request calls for expansion of the program's scope and is designed to accomplish the federal energy management goals set forth in the Energy Policy Act of 1992 and Executive Order 12902, including a 30 percent improvement in energy efficiency in Federal buildings by 2005, compared to 1985 levels. The budget request significantly accelerates FEMP's efforts to deliver energy savings through Energy Savings Performance Contracts (ESPCs), utility financing, and procurement of energy efficient products.

FEMP's efforts on ESPCs through FY 1998 concentrate on implementing conventional energy efficiency technologies through regional ESPCs. The FY 1999 request supports expansion of the types of products and services covered by ESPCs. For example, in FY 1999,

**EXECUTIVE SUMMARY:** Energy Efficiency Programs (Cont'd)

FEMP will finalize the awards of currently planned technology-specific Super ESPCs. These contracts require the use of advanced technologies in order to achieve energy cost savings and thereby provide an important vehicle for deploying recently developed EERE technologies, including solar, wind, and biomass technologies. Technology-specific ESPCs will increase the total contract value of all FEMP contracts to over five billion dollars. Together, the regional ESPCs and technology- specific ESPCs are projected to cut Federal energy costs by over 11 billion dollars over the life of the projects. A portion of these savings will be used to pay contractors for their initial private investment in implementing the technologies.

In FY 1999, contingent upon additional legislative authority, FEMP also plans to initiate ESPCs for mobile equipment including aircraft, ships, and heavy duty vehicles as a new component of its technical and financial assistance programs. In addition, FEMP plans to expand its ESPC assistance to support energy improvements in Federal leased space.

As a corollary to its ESPC efforts, the Department is instituting administrative mechanisms and contractual arrangements needed to recover funds from other agencies in the future. Under Public Law 105-83, the Department of Energy can accept funds from Federal agencies that realize energy cost savings as a result of FEMP's assistance with energy savings performance contracts and other private financing mechanisms. Appropriations in FY 1998 and 1999 provide the principal source of funds for the start-up of FEMP's assistance to other agencies. In the initial years of the process, revenues are expected to be small relative to appropriations, but will build in later years as assisted agency savings are realized.

In FY 1999, FEMP will also identify cost-effective opportunities for combined heat and power technology, and co-firing of biomass in boilers at Federal sites. FEMP plans to expand its work on the procurement of energy efficient equipment, and will streamline energy efficient and renewable energy purchases associated with the Million Solar Roofs Initiative and other cost-effective site-based projects. FEMP will continue its work to support the Million Solar Roofs Initiative by helping the Federal government realize its goal of installing 20,000 cost-saving, solar energy systems on Federal facilities by the end of 2010. In addition, FEMP will support the Interagency Energy Management Task Force's new efforts to develop effective approaches to procurement of bulk electricity, including "green power," in the emerging restructured utility environment.

**EXECUTIVE SUMMARY:** Energy Efficiency Programs (Cont'd)

**PROGRAM IN BRIEF**

The Federal Energy Management Program has achieved impressive gains, exceeding its interim goal of reducing energy consumption in Federal buildings by 10 percent per square foot between 1985 and 1995. FEMP provides energy management assistance to Federal customers, particularly in the area of alternative finance. The six Energy Efficiency and Renewable Energy Regional Support Offices implement the FEMP Program in the field, along with utility partners and state energy offices. By the end of FY 1998, as part of its assistance with alternative financing mechanisms, FEMP will have initiated six regional Super Energy Savings Performance Contracts (ESPCs) and additional technology-specific super ESPCs to assist Federal agencies across the country in purchasing energy efficiency and renewable energy services. These streamlined regional contracts use private capital to provide energy efficiency services to Federal facilities across all six regions, and allow Federal agencies to pay for these services through energy cost savings.

**Private Financing for Federal Savings**

The Federal Energy Management Program has developed broad, streamlined Super Energy Savings Performance Contracts (ESPCs) that allow Federal agencies to quickly reap large benefits from energy efficiency and renewable energy improvements. With these contracts, private firms incur the costs of installing energy retrofits at Federal facilities in exchange for a share of the resulting cost savings.

In addition to its assistance on financing options, FEMP provides technical assistance through SAVEnergy audits, evaluates proposals in response to solicitations, provides up front engineering and design support, and assists in the measurement and verification of energy savings from these projects. FEMP also develops analytical tools and information to assist Federal agencies in choosing cost-effective energy projects and products suited to ESPCs or other leveraged financing mechanisms.

FEMP's training and outreach programs promote understanding and acceptance of ESPCs and other innovative financing tools among Federal energy managers, procurement specialists, and facility managers. Training programs, which trained over 2300 Federal energy managers in FY 1997, provide up-to-date information on technical tools, techniques, and financial mechanisms for encouraging energy efficiency and use of renewable energy sources. Outreach helps raise awareness of FEMP's assistance on alternative financing, and provides opportunities for Federal agencies to share success stories and lessons learned.

FEMP maintains active communication with its customers through the Interagency Energy Management Task Force and the Interagency Energy Policy "656" Committee. As part of its involvement in these policy forums, FEMP identifies and resolves barriers to the use of ESPCs and other energy efficiency mechanisms, obtains feedback, and reports progress to Congress. FEMP continues to strengthen its program through integrated planning, analysis of emerging policy issues, exploration of new initiatives, and targeted program evaluation.

## CROSS-CUTTING ACTIVITIES

A number of EERE's activities are mutually supportive and provide cross-cutting benefits to multiple sectors and customers. Many of EERE's activities and research initiatives also complement other public and private sector efforts. EERE participates in inter-agency and inter-sector committees to review and coordinate work on a number of cross-cutting issues. EERE also works closely with industry, universities, and interest groups to identify research priorities and critical gaps in research and development. Through these collaborative efforts, EERE is working to ensure that Federal investments in R&D complement private sector efforts and are directed at areas that offer the greatest public benefit.

The following list highlights some collaborative efforts among EERE sectors as well as with other Federal programs.

- *Fuel Cells* (OTT, BTS, OUT, FE)

  Proton-Exchange-Membrane (PEM) fuel cell technology, being developed by EERE's Office of Transportation Technologies (OTT), Office of Building Technology, State, and Community Programs (BTS), and Office of Utility Technologies' Hydrogen Program, can be used effectively for power generation in vehicles, buildings, and distributed power applications. In addition to coordinating fuel cell efforts across sector programs, EERE is working closely with industry to identify technical and cost requirements as well as cross-cutting R&D needs for different types of applications. Recent major developments in the transportation sector are contributing to earlier introduction of the technology in stationary applications for the buildings and utilities sector, which in turn, will accelerate commercialization and infrastructure development. In addition to providing an alternative and efficient energy source, application of fuel cells in small commercial buildings can lead to cost savings and reliability improvements for both transportation and building uses.

  DOE's Office of Fossil Energy (FE) is also working on developing fuel cell technologies (other than PEM) primarily for large utility applications. EERE has collaborated with FE to identify applications of these different types of fuel cells (high temperature) to the transportation sector, particularly for large vehicles such as buses.

- *Advanced Turbines* (OIT, FEMP, FE, ER, NASA, NIST, DOD, California Energy Commission, EPRI, GRI, EPA)

  EERE's Office of Industrial Technology (OIT) is working to develop energy efficient, advanced turbines that will be broadly

applicable to industry, Federal installations, and private buildings. These turbines will reduce energy use by 15 percent compared to conventional gas combustion turbines and associated emissions by 80 percent. Advanced turbines will also enhance customer flexibility by allowing facilities to produce energy efficiently off-grid with the use of individual generators. This technology offers great opportunities for application to Federal and other facilities. As a corollary effort, OIT and DOE's Office of Energy Research (ER) conduct research and development on materials that can be used in manufacturing the turbines. A number of other entities, noted above, are conducting complementary research and demonstration efforts.

- *Whole Buildings* (BTS, FEMP)

  With its whole buildings approach, EERE's Office of Building Technology, State, and Community Programs (BTS) identifies appropriate use of energy efficient technologies and renewable energy options in the design and construction of buildings. The Federal Energy Management Program (FEMP) works with Federal agencies to apply the whole buildings approach to the Federal government's existing and future building stock.

- *Million Solar Roofs Initiative* (BTS, FEMP, OUT)

  EERE's Office of Utility Technologies (OUT) funds research and development of solar technologies, including multiple types of panels and solar shingles. With many of these technologies already in the market, OUT is working to develop improved products that offer greater conversion efficiency and are more cost-effective. The Million Solar Roofs Initiative provides an opportunity for BTS and FEMP to help expand the use of solar energy in Federal and other buildings. FEMP will help meet the President's goal of placing a minimum of 20,000 solar roofs on Federal buildings by the year 2010. A number of BTS programs, including Rebuild America, Building America, and the Affordable Housing Programs will integrate solar technologies into their portfolio of assistance to building partners.

- *The Partnership for a New Generation of Vehicles*
  (DOC, DOE [OTT, OIT, OUT, ER], EPA, DOT, NASA, DOD, NSF)

  The Partnership for a New Generation of Vehicles (PNGV) is a cooperative research and development program between the Federal government and the United States Council for Automotive Research (USCAR). The three major domestic automakers are working with seven federal government agencies, labor, suppliers, and universities, to develop efficient, low-emission vehicles for the 21st Century. Research and technology development efforts are focused in four key system areas: hybrid-electric

vehicle drive, direct-injection engines, fuel cells, and lightweight materials. Technical teams, comprised of Federal, laboratory, and industry members, identify technical objectives, milestones, and priorities for research and development. While OTT provides over 80 percent of the federal resources for R&D activities relevant to the PNGV and coordinated with the technical teams, valuable contributions are made by OIT's work on low-cost methods for producing aluminum, OUT's development of enabling technologies for the use of hydrogen in fuel cells, and ER's basic research in materials and electrochemical compounds for consumer electronic applications.

- *Natural Gas* (OIT, BTS, OTT)

  Natural gas serves as a fuel source in industrial, building, and transportation applications. Because a number of EERE's developing technologies use natural gas as a fuel source, EERE sector programs are coordinating their efforts, both within EERE and with the natural gas industry, to ensure that public and private R&D investments are directed most effectively. Fuel cells, advanced turbine systems, and combustion systems, such as boilers and process heaters, rely on natural gas as a premier fuel source for both efficiency and environmental reasons. Furthermore, OTT is working on the development and deployment of natural gas vehicles. BTS is developing advanced heat pumps and chillers which use natural gas to heat and cool buildings to increase heating efficiency and reduce electric peak loads.

- *Combined Heat and Power* (OIT, FEMP, BTS, EPA)

  EERE's Office of Industrial Technology's work in developing combined heat and power systems and improving their efficiency has broad application to buildings, and industrial and Federal facilities. Combined heat and power systems generate multiple types of power, including electricity, steam, and mechanized energy by using the same fuel source. These systems can provide significant energy savings as well as environmental benefits. The Environmental Protection Agency's involvement focuses on streamlining the permitting process for these systems and offering one-stop permitting opportunities. In addition, the BTS work on fuel cells is specifically targeted to producing both heat and electricity for buildings.

## Regional Support Offices

### *Implementing EERE's Programs in the Field*

EERE's Regional Support Offices (RSOs) facilitate deployment of EERE's grant and technology programs to federal, regional, state and local customers. Along with state energy and weatherization offices and EERE's sector programs, the RSO's are critical to implementing EERE programs in the field.

In FY 1997, EERE began to integrate RSO operations more effectively into EERE program planning. Each RSO is responsible for developing an annual operating plan that includes proposals to support various sector programs. In turn, the sector programs use these plans to identify opportunities for innovative program delivery methods in the regions, and to determine how to allocate program funds among RSOs.

**NEW ACTIVITIES IN FY 1999**

In FY 1999, RSOs will play a key role in the implementation of the Million Solar Roofs Initiative. Each RSO will develop an outreach and technical assistance approach best suited to the needs of its region. In FY 1999, EERE is also requesting funds specifically to support Centers of Excellence in the Denver and Atlanta RSOs to address cross-cutting efficiency and renewable issues related to sustainable development and disaster remediation respectively.

RSOs will continue work begun in FY 1997 and FY 1998 to develop a more efficient, community-based approach to implement EERE programs. Finally, the RSOs will continue to develop best-practice methods for administering state formula grant programs, with a focus on increasing inter-and intra-regional transfer of programs and technologies developed through the state energy and weatherization programs.

**THE MISSION OF THE REGIONAL SUPPORT OFFICES**

The RSOs perform four key functions:

- Support the deployment of EERE programs and technologies by working to understand regional markets; preparing and implementing integrated regional outreach and deployment plans; providing technical assistance, information and training; and, executing and administering financial assistance.

RSOs support programs including FEMP, Rebuild America, Building Standards and Guidelines, Motor Challenge, Clean Cities, NICE3, Affordable Housing, and Geothermal Heat Pumps, among others. Each RSO emphasizes different program areas, depending upon staff skills and regional customers' interests. RSOs are working to package existing EERE programs and services into portfolios that respond more effectively to the expressed needs of states and communities.

- Provide headquarters program offices with information and feedback regarding regional needs; effectiveness of existing outreach activities; options for enhancing program effectiveness; and, opportunities for regional, state, and local partnerships.

- Provide liaison between headquarters and regional customers by serving as the principal EERE point of contact for these stakeholders; and, where possible, acting as a point of contact for stakeholders seeking assistance from other DOE and federal offices as well as DOE laboratories.

  Each RSO periodically holds meetings with state energy and weatherization offices to collect feedback on RSO and sector program administration. In FY 1997 and FY 1998, each RSO sponsored meetings involving the states, the RSO, the sector programs, and EERE management, as part of an ongoing effort to improve communication and coordination among all parties.

- Operate specialized outreach activities. Several RSOs are developing methods of bundling EERE programs and services to improve service delivery, and serving as lead offices for national components of the Clean Cities Program.

**RSO FUNDING AND FTE LEVELS**

The following chart illustrates operational funding levels for the six RSOs for FY 1997, FY 1998, and FY 1999. RSO funding levels are determined through an extensive planning process which involves both the RSOs and EERE's sector programs and results in an annual operating plan for each RSO.

The chart also provides information on FTEs for each RSO. The FTE figures represent planned FTE levels rather than actual FTEs in each office.

| **Regional Support Offices: Operational Funds and Planned FTE Levels** (in millions of dollars) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | FY 1997 | | FY 1998 | | FY 1999 Request | | Program Change | |
| | $ | FTE | $ | FTE | $ | FTE | $ | FTE |
| Atlanta Support Office | $1.4 | 18 | $1.7 | 23 | $2.1 | 24 | $0.3 | 1 |
| Boston Support Office | 1.5 | 13 | 1.7 | 15 | 2.1 | 15 | 0.4 | 0 |
| Chicago Support Office | 1.8 | 15 | 2.1 | 18 | 2.5 | 19 | 0.4 | 1 |
| Denver Support Office | 1.9 | 20 | 2.5 | 25 | 3.0 | 26 | 0.5 | 1 |
| Philadelphia Support Office | 1.8 | 17 | 2.1 | 17 | 2.5 | 18 | 0.4 | 1 |
| Seattle Support Office | 2.0 | 22 | 2.3 | 19 | 2.9 | 19 | 0.6 | 0 |
| Total Budget Authority | 10.4 | 105 | 12.4 | 117 | 15.0 | 121 | 2.6 | 4 |
| Unobligated Carryover | 1.3 | -- | -- | -- | -- | -- | -- | -- |
| Total Obligational Authority | $11.7 | 105 | $12.4 | 117 | $15.0 | 121 | $2.6 | 4 |

DEPARTMENT OF ENERGY
FY 1999 CONGRESSIONAL BUDGET REQUEST
ENERGY CONSERVATION
(Dollars in thousands)

Energy Efficiency
**PROGRAM FUNDING DETAIL**

| Program/Subprogram/Activity | FY 1997 Enacted | FY 1998 Enacted | FY 1999 Request |
|---|---|---|---|
| **I. Transportation Sector, Total** | **$172,457** | **$193,271** | **$246,096** |
| A. Technology Deployment | 10,618 | 11,775 | 16,250 |
| B. Advanced Automotive Technologies | 102,717 | 113,296 | 144,646 |
| C. Advanced Heavy Vehicle Technologies | 19,129 | 25,600 | 44,200 |
| D. Transportation Materials Technologies | 32,256 | 35,000 | 31,800 |
| E. Implementation and Program Management | 7,737 | 7,600 | 9,200 |
| | | | |
| **II. Industry Sector, Total** | **115,424** | **136,197** | **166,559** |
| A. Industries of the Future (Specific) | 45,332 | 53,078 | 76,000 |
| B. Industries of the Future (Crosscutting) | 38,378 | 49,120 | 49,400 |
| C. Technology Access | 24,827 | 26,299 | 32,000 |
| D. Management & Planning | $6,887 | $7,700 | $9,159 |
| | | | |
| **III. Building Technology, State, and Community Sector, Total** | **229,899** | **233,875** | **317,545** |
| A. Building Systems Design | 23,255 | 22,986 | 36,373 |
| B. Building Equipment and Materials | 26,080 | 26,921 | 46,181 |
| C. Codes & Standards | 11,810 | 14,423 | 22,573 |
| D. State and Local Partnership Programs | 151,421 | 156,695 | 197,700 |
| E. Management and Planning | 17,333 | 12,850 | 14,718 |
| | | | |
| **IV. Federal Energy Management Program, Total** | **$19,800** | **$19,800** | **$33,868** |

DEPARTMENT OF ENERGY
FY 1999 CONGRESSIONAL BUDGET REQUEST
ENERGY CONSERVATION
(Dollars in thousands)

Energy Efficiency
**PROGRAM FUNDING DETAIL**

| Program/Subprogram/Activity | FY 1997 Enacted | FY 1998 Enacted | FY 1999 Request |
|---|---|---|---|
| **V. Policy and Management, Total** | **$26,403** | **$28,580** | **$44,432** |
| | | | |
| R&D | 414,138 | 456,628 | 617,400 |
| ENERGY CONSERVATION GRANTS | 149,845 | 155,095 | 191,100 |
| | | | |
| **SUBTOTAL ENERGY CONSERVATION** | | | |
| **PROGRAM LEVEL** | **563,983** | **611,723** | **808,500** |
| Financing: Use of Prior Year Balances | -480 | 0 | 0 |
| Subtotal | 563,503 | 611,723 | 808,500 |
| Financing: PODRA | -29,997 | -20,611 | -35,000 |
| | | | |
| **TOTAL ENERGY CONSERVATION BA** | **$533,506** | **$591,112** | **$773,500** |
| | | | |
| Total FTEs | 432 | 430 | 427 |

DEPARTMENT OF ENERGY
FY 1999 CONGRESSIONAL BUDGET REQUEST
ENERGY CONSERVATION
(Dollars in thousands)

Energy Efficiency
**PROGRAM FUNDING DETAIL**

| Program/Subprogram/Activity | FY 1997 Enacted | FY 1998 Enacted | FY 1999 Request |
|---|---|---|---|
| **I. Transportation Sector, Total** | **$172,457** | **$193,271** | **$246,096** |
| | | | |
| A. Technology Deployment | 10,618 | 11,775 | 16,250 |
| 1. Clean Cities Voluntary Deployment | 2,606 | 2,850 | 6,000 |
| 2. Infrastructure, Systems, and Safety | 1,605 | 2,175 | 2,000 |
| 3. EPACT Replacement Fuels Program | 1,475 | 1,400 | 1,300 |
| 4. Vehicle Field Test/Evaluation | 2,432 | 2,850 | 3,450 |
| 5. Technical Information Development | 2,500 | 2,500 | 3,500 |
| | | | |
| B. Advanced Automotive Technologies | 102,717 | 113,296 | 144,646 |
| 1. Automotive Alternative Fuels R&D | 3,160 | 5,550 | 7,000 |
| 2. Electric Vehicle R&D | 17,497 | 18,386 | 11,000 |
| 3. Vehicle Systems R&D | 53,840 | 58,200 | 58,000 |
| 4. Fuel Cell R&D | 20,760 | 23,560 | 44,646 |
| 5. Advanced Combustion Engine R&D | 7,460 | 7,600 | 18,000 |
| 6. Cooperative Automotive Research for Advanced Technology | 0 | 0 | 6,000 |
| | | | |
| C. Advanced Heavy Vehicle Technologies | 19,129 | 25,600 | 44,200 |
| 1. Heavy Vehicle Systems R&D | 6,970 | 12,900 | 33,200 |
| 2. Heavy Vehicle Alternative Fuels R&D | $12,159 | $12,700 | $11,000 |

DEPARTMENT OF ENERGY
FY 1999 CONGRESSIONAL BUDGET REQUEST
ENERGY CONSERVATION
(Dollars in thousands)

Energy Efficiency
**PROGRAM FUNDING DETAIL**

| Program/Subprogram/Activity | FY 1997 Enacted | FY 1998 Enacted | FY 1999 Request |
|---|---|---|---|
| D. Transportation Materials Technologies | $32,256 | $35,000 | $31,800 |
| 1. Automotive Materials Technology | 19,997 | 21,750 | 19,000 |
| 2. Heavy Vehicle Materials Technology | 7,702 | 8,050 | 7,300 |
| 3. High Temperature Materials Laboratory | 4,557 | 5,200 | 5,500 |
| | | | |
| E. Implementation and Program Management | 7,737 | 7,600 | 9,200 |
| 1. Evaluation, Planning and Analysis | 1,700 | 1,700 | 2,500 |
| 2. Program Direction | $6,037 | $5,900 | $6,700 |
| | | | |
| Staffing Transportation Sector (FTEs): | | | |
| Oak Ridge Operations Office | 1 | 1 | 1 |
| Headquarters | 67 | 60 | 57 |
| Total FTEs | 68 | 61 | 58 |

DEPARTMENT OF ENERGY
FY 1999 CONGRESSIONAL BUDGET REQUEST
ENERGY CONSERVATION
(Dollars in thousands)

Energy Efficiency
**PROGRAM FUNDING DETAIL**

| Program/Subprogram/Activity | FY 1997 Enacted | FY 1998 Enacted | FY 1999 Request |
|---|---|---|---|
| **II. Industry Sector, Total** | **$115,424** | **$136,197** | **$166,559** |
| | | | |
| A. Industries of the Future (Specific) | 45,332 | 53,078 | 76,000 |
| 1. Forest & Paper Products Vision | 10,843 | 12,040 | 12,076 |
| 2. Steel Vision | 8,905 | 9,726 | 10,627 |
| 3. Aluminum Vision | 5,503 | 7,335 | 9,178 |
| 4. Metal Casting Vision | 3,399 | 5,480 | 5,797 |
| 5. Glass Vision | 2,917 | 3,883 | 4,830 |
| 6. Chemicals Vision | 9,983 | 11,614 | 14,492 |
| 7. Petroleum Refining Vision | 3,782 | 3,000 | 0 |
| 8. Environmental Solicitations | 0 | 0 | 19,000 |
| | | | |
| B. Industries of the Future (Crosscutting) | 38,378 | 49,120 | 49,400 |
| 1. Cogeneration | 24,157 | 34,650 | 33,000 |
| 2. Advanced Materials & CFCCs | 14,221 | 14,470 | 14,400 |
| 3. Combustion Technologies | 0 | 0 | 2,000 |
| | | | |
| C. Municipal Solid Waste | 0 | 0 | 0 |
| | | | |
| D. Technology Access | 24,827 | 26,299 | 32,000 |
| 1. IACs/Technology Transfer | 8,125 | 9,109 | 8,700 |
| 2. Motor Challenge | 5,138 | 6,230 | 11,000 |
| 3. NICE-3 | $5,800 | $6,000 | $7,500 |

DEPARTMENT OF ENERGY
FY 1999 CONGRESSIONAL BUDGET REQUEST
ENERGY CONSERVATION
(Dollars in thousands)

Energy Efficiency
**PROGRAM FUNDING DETAIL**

| Program/Subprogram/Activity | FY 1997 Enacted | FY 1998 Enacted | FY 1999 Request |
|---|---|---|---|
| 4. Climate Wise | $1,000 | $0 | $0 |
| 5. Inventions & Innovation | 4,764 | 4,960 | 4,800 |
| | | | |
| E. Management & Planning | 6,887 | 7,700 | 9,159 |
| 1. Evaluation and Planning | 500 | 800 | 1,000 |
| 2. Program Direction | 6,387 | 6,900 | 8,159 |
| 3. Capital Equipment | $0 | $0 | $0 |
| | | | |
| Staffing Industry Sector (FTEs): | | | |
| Chicago Operations Office | 5 | 6 | 6 |
| Idaho Operations Office | 4 | 5 | 5 |
| Headquarters | 61 | 61 | 61 |
| Total FTEs | 70 | 72 | 72 |

DEPARTMENT OF ENERGY
FY 1999 CONGRESSIONAL BUDGET REQUEST
ENERGY CONSERVATION
(Dollars in thousands)

Energy Efficiency
**PROGRAM FUNDING DETAIL**

| Program/Subprogram/Activity | FY 1997 Enacted | FY 1998 Enacted | FY 1999 Request |
|---|---|---|---|
| **III. Building Technology, State, and Community Sector, Total** | **$229,899** | **$233,875** | **$317,545** |
| | | | |
| A. Building Systems Design | 23,255 | 22,986 | 36,373 |
| 1. Residential Buildings | 10,157 | 9,697 | 15,292 |
| 2. Commercial Buildings | 13,098 | 13,289 | 21,081 |
| | | | |
| B. Building Equipment and Materials | 26,080 | 26,921 | 46,181 |
| 1. Technology Roadmaps and Competitive R&D | 0 | 0 | 8,000 |
| 2. Space Conditioning and Cogeneration | 11,440 | 12,430 | 15,380 |
| 3. Lighting and Appliance | 6,798 | 5,342 | 11,080 |
| 4. Building Envelope R&D | 7,842 | 9,149 | 11,721 |
| | | | |
| C. Codes & Standards | 11,810 | 14,423 | 22,573 |
| 1. Building Standards & Guidelines | 6,808 | 8,423 | 12,953 |
| 2. Lighting and Appliance Standards | 5,002 | 6,000 | 9,620 |
| | | | |
| D. State and Local Partnership Programs | 151,421 | 156,695 | 197,700 |
| 1. Weatherization Assistance Program | 120,845 | 124,845 | 154,100 |
| 2. State Energy Program | 29,000 | 30,250 | 37,000 |
| 3. Municipal Energy Management | $1,576 | $1,600 | $6,600 |

DEPARTMENT OF ENERGY
FY 1999 CONGRESSIONAL BUDGET REQUEST
ENERGY CONSERVATION
(Dollars in thousands)

Energy Efficiency
**PROGRAM FUNDING DETAIL**

| Program/Subprogram/Activity | FY 1997 Enacted | FY 1998 Enacted | FY 1999 Request |
|---|---|---|---|
| E. Management and Planning | $17,333 | $12,850 | $14,718 |
| 1. Evaluation and Planning | 10,409 | 5,500 | 7,268 |
| 2. Program Direction | 6,924 | 7,350 | 7,450 |
| 3. Capital Equipment | $0 | $0 | $0 |
| | | | |
| Staffing Building Technology, State, & | | | |
| Community Sector (FTEs): | | | |
| Headquarters | 81 | 74 | 75 |
| Total FTEs | 81 | 74 | 75 |

DEPARTMENT OF ENERGY
FY 1999 CONGRESSIONAL BUDGET REQUEST
ENERGY CONSERVATION
(Dollars in thousands)

Energy Efficiency
**PROGRAM FUNDING DETAIL**

| Program/Subprogram/Activity | FY 1997 Enacted | FY 1998 Enacted | FY 1999 Request |
|---|---|---|---|
| **IV. Federal Energy Management Program, Total** | **$19,800** | **$19,800** | **$33,868** |
| | | | |
| A. Project Financing | 7,000 | 7,900 | 13,864 |
| B. Technical Guidance & Assistance | 6,800 | 6,300 | 10,704 |
| C. Planning, Reporting, & Evaluation | 4,200 | 3,800 | 6,400 |
| D. Capital Equipment | 0 | 0 | 0 |
| E. Program Direction | 1,800 | 1,800 | 2,900 |
| | | | |
| Staffing Federal Energy Management | | | |
| Program (FTEs): | | | |
| Headquarters | 23 | 20 | 20 |
| Total FTEs | 23 | 20 | 20 |
| | | | |
| **V. Policy and Management, Total** | **26,403** | **28,580** | **44,432** |
| | | | |
| A. Headquarters | 7,398 | 7,494 | 15,252 |
| 1. Salaries and Related Expenses | 4,398 | 3,425 | 3,990 |
| 2. Contractual Services | 3,000 | 4,069 | 11,262 |
| | | | |
| B. Golden Field Office | 4,505 | 4,546 | 4,790 |
| 1. Salaries and Related Expenses | 2,655 | 3,896 | 4,018 |
| 2. Contractual Services | $1,850 | $650 | $772 |

DEPARTMENT OF ENERGY
FY 1999 CONGRESSIONAL BUDGET REQUEST
ENERGY CONSERVATION
(Dollars in thousands)

Energy Efficiency
**PROGRAM FUNDING DETAIL**

| Program/Subprogram/Activity | FY 1997 Enacted | FY 1998 Enacted | FY 1999 Request |
|---|---|---|---|
| C. Regional Support Offices | $10,400 | $12,390 | $14,990 |
| 1. Salaries and Related Expenses | 7,421 | 8,101 | 8,741 |
| 2. Contractual Services | 2,979 | 4,289 | 6,249 |
| | | | |
| D. Centers of Excellence | 0 | 0 | 2,000 |
| E. International Market Development Program | 2,600 | 2,600 | 2,900 |
| F. Information and Communications Program | 1,500 | 1,550 | 2,000 |
| G. Policy Initiatives | 0 | 0 | 2,500 |
| | | | |
| Staffing Policy Management (FTEs): | | | |
| Golden Field Office | 25 | 35 | 36 |
| Regional Support Offices | 105 | 117 | 121 |
| Headquarters | 60 | 51 | 45 |
| Total FTEs | 190 | 203 | 202 |
| | | | |
| R&D | 414,138 | 456,628 | 617,400 |
| ENERGY CONSERVATION GRANTS | 149,845 | 155,095 | 191,100 |
| | | | |
| **SUBTOTAL ENERGY CONSERVATION** | | | |
| **PROGRAM LEVEL** | **563,983** | **611,723** | **808,500** |
| | | | |
| Financing: Use of Prior Year Balances | -480 | 0 | 0 |
| Subtotal | $563,503 | $611,723 | $808,500 |

DEPARTMENT OF ENERGY
FY 1999 CONGRESSIONAL BUDGET REQUEST
ENERGY CONSERVATION
(Dollars in thousands)

Energy Efficiency
**PROGRAM FUNDING DETAIL**

| Program/Subprogram/Activity | FY 1997 Enacted | FY 1998 Enacted | FY 1999 Request |
|---|---|---|---|
| Financing: PODRA | -$29,997 | -$20,611 | -$35,000 |
| | | | |
| **TOTAL ENERGY CONSERVATION BA** | **$533,506** | **$591,112** | **$773,500** |
| | | | |
| Total FTEs | 432 | 430 | 427 |

**Energy Conservation**
**Small Business Innovation Research (SBIR)**
**Small Business Technology Transfer (STTR)**
**(Dollars in thousands)**

| | FY 1997 Actual | | | FY 1998 Estimate | | | FY 1999 Estimate | | |
|---|---|---|---|---|---|---|---|---|---|
| | SBIR | STTR | Total | SBIR | STTR | Total | SBIR | STTR | Total |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Transportation Sector | $2,858 | $226 | $3,084 | $3,112 | $187 | $3,299 | $3,845 | $231 | $4,076 |
| | | | | | | | | | |
| Building Technology, State, and Community Sector | 1,060 | 84 | 1,144 | 1,107 | 66 | 1,173 | 1,786 | 105 | 1,891 |
| | | | | | | | | | |
| Federal Energy Management Program | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | | | | |
| Industry Sector | 1,881 | 148 | 2,029 | 2,156 | 130 | 2,286 | 2,518 | 153 | 2,671 |
| | | | | | | | | | |
| Policy and Management | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | | | | |
| Total Energy Conservation Appropriation | $5,799 | $458 | $6,257 | $6,375 | $383 | $6,758 | $8,149 | $489 | $8,638 |